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SHORT COMMUNICATION

The first case of gynandry in Mygalomorphae: *Pterinochilus murinus*, morphology and comments on sexual behavior (Araneae: Theraphosidae)

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Abstract. A bilateral gynandromorph specimen of the tarantula *Pterinochilus murinus* Pocock, 1897 is here described and illustrated. In addition, encounters with conspecific females were studied. The possible explanations for this case of gynandry are discussed. This constitutes the first formal report of gynandry in a mygalomorph spider.

Keywords: Bilateral-gynandromorph, mygalomorph

Gynandromorph spiders are adult individuals in which female and male parts of the body are discretely combined. These combinations can occur laterally, transversely, obliquely or irregularly. Intersexuality is another condition in which parts of the body have an intermediate morphology between sexes (Roberts & Parker 1973). After Blackwall (1867), about 50 cases of gynandry have been reported for araneomorph spiders (Cokendolpher & Sissom 1988) comprising the families: Agelenidae (Kaston 1961), Dictynidae (Kaston 1961), Gnaphosidae (Roberts & Parker 1973), Hahniidae (Kaston 1961), Linyphiidae (Hackman 1950-1951; Knülle 1954; Waaler 1970; Roberts & Parker 1973; Palmgren 1979; Wunderlich 1994), Liocranidae (Krumpalova 1999), Lycosidae (Holm 1941; Wiebes 1959; Kaston 1961; Mackie 1969; Gack & Helversen 1976; Stratton 1995), Oxyopidae (Simó et al. 2007), Philodromidae (Roberts & Parker 1973), Phrurolithidae (Kaston 1961), Salticidae (Kaston 1961; Roberts & Parker 1973), Theridiidae (Roberts & Parker 1973; Kumada 1989) and Thomisidae (Kaston 1961). Despite this diversity of findings, the frequency of gynandromorphs in spiders is estimated to occur in one out of 17,000 individuals (Palmgren 1979), thus being a rare phenomenon. As far as we know, there are no formal reports of gynandry among Mygalomorphae, however at least an image of the theraphosid *Poecilotheria* sp. gynandromorph is available on the Internet at http://arachnoboards.eom/threads/poecilotheria-ornata-gynandromoph.60259/

In this paper, we report the first gynandromorph tarantula, describe its morphology and study its sexual behavior in encounters with adult conspeeific females.

Spiderlings of *Pterinochilus murinus* Pocock, 1897 were donated from an amateur tarantula keeper (Montevideo, Uruguay) and raised in the laboratory to maturity. After adulthood, a couple of them copulated in the laboratory in January 2010, the female laid the egg sac and spiderlings emerged in April 2010. Some of these spiderlings were raised and they reach maturity in December 2014. Among these individuals, we found one with gynandromorphic characteristics which we studied and describe here.

Measurements are in mm and were obtained using a stereomicroscope (Olympus, SZH, Japan) with ocular micrometer. Drawings were done with a camera lucida (Olympus, SZH, Japan). Spination nomenclature follows Pérez-Miles et al. (2008). The gynandromorph individual was compared with the descriptions of females and males of the species, given by Gallon (2002, 2008) and deposited in the Arachnological Collection of the Facultad de Ciencias, Montevideo, Uruguay (FCE-My 1406). Abbreviations: AME = anterior median eyes, ALE = anterior lateral eyes, PME = posterior median eyes, PLE = posterior lateral eyes, OQ = ocular quadrangle (including lateral eyes); d = dorsal, p = prolateral, r = retrolateral; PMS = posterior median spinnerets, PLS = posterior lateral spinnerets; v = ventral; ri = right, le = left.

The gynandromorph presents bilateral differences the right side shows female characteristics and the left side male ones (Fig. 1) which corresponds to the regular Type I gynandromorph of Roberts & Parker (1973). Female and male areas were normally developed after maturation, but in the first post-maturation molt, the male palpal organ was aberrant (Fig. 2A, B) while the female palp remains normal (Fig. 2D, E). Total length, excluding chelicerae and spinnerets, is 37.51. Carapace length 15.38, width 13.13. Anterior eye row procurved, posterior straight. Eye sizes: AME 0.6 (ri, le), ALE 0.8 (ri, le), PME 0.6 (ri, le), PLE 0.8 (ri, le). OQ length 2.4, width 3.1, clypeus 0.7. Fovea transverse, straight, width 1.5. Labium length 1.7, width 2.2 with 56 cuspules, maxillae with 245 (ri)–254 (le) euspules. Sternum length 8.8, width 6.5. Chelicerae proximal segment 8.38 (ri), 7.25 (le), distal segment 6.25 (ri), 5.25 (le). Chelicerae teeth on the promargin (distal–basal): 9 large and 7 small (ri); 2 large, 4 small, 2 large, 8 small (le). Tarsi I–IV densely scopulated, scopula I–IV entire (ri more dense and dark than le). Metatarsi I and II scopulate; III scopulate on their apical 3/4 (ri), 2/3 (le), IV scopulate on their apical 1/2 (ri), 2/3 (le). Tibia I (le) with a distal proventral apophyses (Fig. 2C). Tibia I (ri) normal (Fig. 2F). Flexion of metatarsus (le) retrolateral with respect to tibial apophyses. Palpal organ (le) as in Fig. 2A, B. Length of leg and palpal segments (right–left side; femur/ patella/ tibia/ metatarsus/ tarsus). Leg I: 13.25–14.25/ 8.13–7.75/ 10.63–11.63/ 9.63–10.63/ 6.63–6.88. Leg II: 12.13–12.88/ 7.13–7.13/ 9.25–10.00/ 8.88–9.75/ 6.25–6.50. Leg III: 10.63–11.00/ 6.38–5.75/ 7.38–8.25/ 9.00–10.38/ 6.25–6.25. Leg IV: 13.00–12.88/ 6.63–6.75/ 7.75–10.63/ 12.50–13.50/ 6.75–7.00. Palp: 9.38–8.50/ 6.00–5.63/ 6.75–6.88/ — / 7.75–3.38. Spination: Femora (ri, le) I–IV and palp 0. Patellae (ri, le) I–IV and palp 0. Tibiae (ri) I 1p; II 0; III 1p; IV 1p; palp 1p; (le) I 0; II 1p; III 1p; IV 1p, 1r; palp 1p. Metatarsi (ri) I 0; II 0; III 3v, 1p, 1r; IV 2v, 1r; (le) I 0; II 0; III 3v,3p; IV 4v, 2d. Tarsi I–IV and palp 0. Abdomen (ri) densely covered by reddish-brown setae, and spermatheca with one curved tubuliform receptacle with globose fundus (Fig. 2G); (le) sparsely covered with setae. Spinnerets PLS (ri) basal segment 1.15; medial 0.95, apical 1.35; (le) basal segment 1.07, medial 0.83, apical 1.11. PMS (ri) 2.26, (le) 1.95.

Color in life (Fig. 1): (ri) Cephalothorax, abdomen and legs covered by reddish-brown setae with darker radial lines on carapace and darker transverse lines on abdomen; (le) Cephalothorax, abdomen and legs dark brown, with reddish brown setae on femora; radial reddish brown lines on carapace.

Figure 1.—Gynandromorph of *Pterinochilus murinus*. Habitus, dorsal view, scale: 200 mm.

The gynandromorph matured in December 2014, after that it molted again in April 2015. After the maturation molt, the gynandromorph presented the palpal organ with the usual morphology of the species but after the last molt the palpal organ showed an aberrant morphology (Fig. 2A, B). The tibial spur after both molts presented a morphology typical of the species but lacking the apical spine (Fig. 2C).

The individuals were raised in plastic containers (14 × 14 x 6 cm) in early instars and then transferred to glass containers (25 × 15 x 15 cm). They were fed with *Drosophila* sp. and *Musca* sp. (Diptera) in early instars, and then *Blaptica dubia* (Blattaria, Blaberidae) according with the individual size of the spider. During rearing, the mean temperature was 17.5 °C (range 11.9–22.7) and mean relative humidity 75% (range 68–85). Behavioral observations were conducted in the laboratory in glass arenas (25 × 12 x 18 cm). The gynandromorph was placed carefully in the container of a female, as far as possible from her. The behavior of the couple was registered by video recording and notes. The observations started when the gynandromorph contacted the female web or substratum and finished if no courtship was observed in 15 minutes or if the female attacked. Four encounters of the gynandromorph with different females were performed with an interval of 48 hours between trials. During the experimental period mean temperature was 25°C (range 24–26) and mean relative humidity 60% (range 47–67).

The gynandromorph did not perform courtship in any of the four encounters with females and females did not show any sexual response. In one trial a female attacked the gynandromorph and damaged leg I.

A common explanation of gynandromorphy in animals (e.g., *Drosophila*) involves the non-disjunction of X chromosomes early in

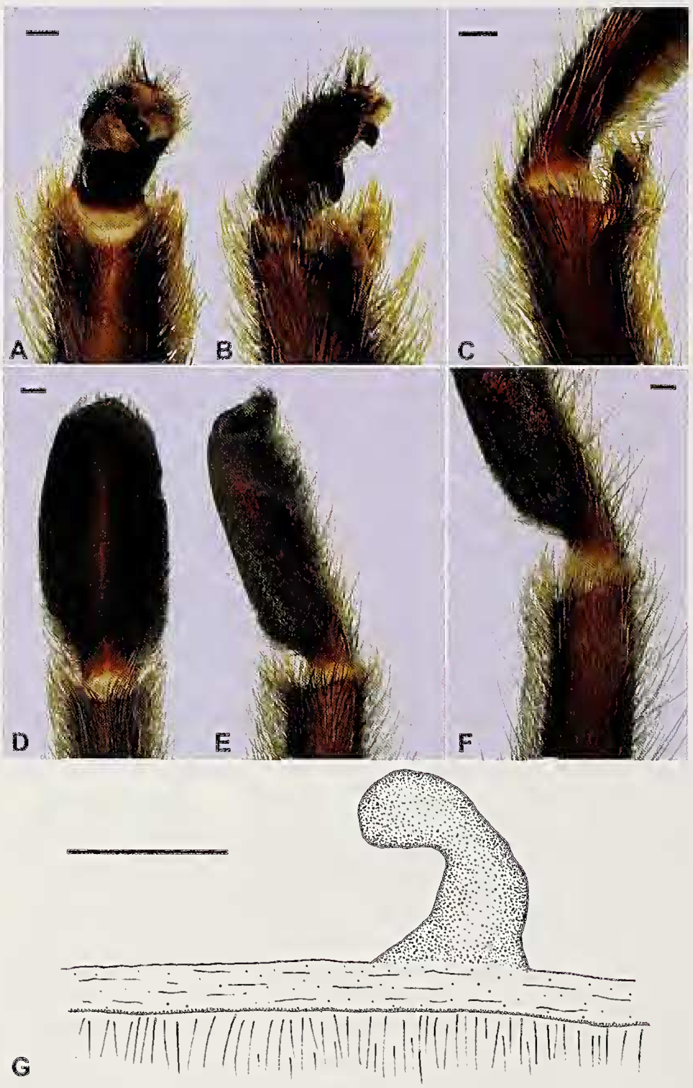

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Figure 2.—Gynandromorph of *Pterinochilus murinus*. A. Left palpal organ, ventral view. B. Same, prolateral view. C. Left tibial apophysis, prolateral view. D. Right palp, ventral view. E. Same, prolateral view. F. Right tibia, prolateral view. G. Right spermatheca, dorsal view. Scales: 1 mm.

development (White 1973; Stratton 1995). Presumably, the same mechanism explains the gynandry in spiders, although it was not investigated in this group (White 1973). Kaston (1961) suggested that gynandromorphy would be less frequent in spiders due to the chromosomal system, where females have two or more sexual X chromosomes than males. The occurrence of a gynandromorph from a female zygote would imply the loss of two or more chromosomes. If we assume this explanation, the regular lateral Type I gynandromorph we found could be the result of the loss of at least one pair of X chromosomes in the first cleavage of the zygote, in a genetically determined female, as suggested by Roberts and Parker (1973). From the morphological point of view, each half of the gynandromorph correspond with the normal body development of each sex comparing with the descriptions of *P. murinus* (Gallon 2002, 2008). A slight difference was found in the spermathecal morphology of the gynandromorph and could be interpreted as an individual variation which is in accord with intraspecific variation (Gallon 2002, 2008). However, from the physiological point of view, female hormonal factors seemed to predominate considering the spider molted after the male half reach adulthood. Also, the gynandromorph was rejected in the encounters with other females probably because of its female behavioral characteristics. These facts could reinforce the hypothesis of Roberts & Parker (1973) who proposed that this type of gynandromorph is produced from a genetically determined female. The lower diversity and scarce studies on Mygalomorphae in comparison with Araneomorphae, could explain our unusual finding.

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